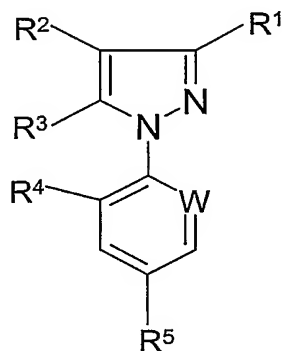


Claims

1. Use of a compound of formula (I) or an agriculturally acceptable salt thereof for plant growth regulation



(I)

wherein:

R^1 is CONR^6R^7 or CO_2R^8 ;

W is C-halogen or N;

R^2 is H or $\text{S(O)}_m\text{R}^9$;

R^3 is $\text{NR}^{10}\text{R}^{11}$, halogen, OH, $(\text{C}_1\text{-C}_6)\text{-alkoxy}$, $(\text{C}_2\text{-C}_6)\text{-alkenyloxy}$ or $(\text{C}_2\text{-C}_6)\text{-alkynyloxy}$;

R^4 is H, or halogen;

R^5 is $(\text{C}_1\text{-C}_4)\text{-haloalkyl}$ or $(\text{C}_1\text{-C}_4)\text{-haloalkoxy}$;

R^6 is H, $(\text{C}_1\text{-C}_6)\text{-alkyl}$, $(\text{C}_1\text{-C}_6)\text{-haloalkyl}$, $(\text{C}_1\text{-C}_6)\text{-alkoxy-(C}_1\text{-C}_6)\text{-alkyl}$, $(\text{C}_2\text{-C}_6)\text{-alkenyl}$, $(\text{C}_2\text{-C}_6)\text{-haloalkenyl}$, $(\text{C}_2\text{-C}_6)\text{-alkynyl}$, $(\text{C}_2\text{-C}_6)\text{-haloalkynyl}$, $(\text{C}_3\text{-C}_7)\text{-cycloalkyl}$, $(\text{C}_3\text{-C}_7)\text{-cycloalkyl-(C}_1\text{-C}_6)\text{-alkyl}$, $(\text{C}_1\text{-C}_6)\text{-alkoxy}$, $(\text{C}_1\text{-C}_6)\text{-alkylthio}$, $(\text{CH}_2)_n\text{R}^{12}$, $(\text{CH}_2)_p\text{R}^{13}$, $(\text{C}_1\text{-C}_6)\text{-alkyl-CN}$, $(\text{C}_1\text{-C}_6)\text{-alkyl-NR}^{10}\text{R}^{11}$ or $(\text{C}_1\text{-C}_6)\text{-alkyl-S(O)}_r\text{R}^9$;

R^7 is H, $(\text{C}_1\text{-C}_6)\text{-alkyl}$, $(\text{C}_3\text{-C}_6)\text{-alkenyl}$ or $(\text{C}_3\text{-C}_6)\text{-alkynyl}$; or

R^6 and R^7 together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, $(\text{C}_1\text{-C}_6)\text{-alkyl}$ and $(\text{C}_1\text{-C}_6)\text{-haloalkyl}$;

R^8 is H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl or (CH₂)_nR¹²;

R^9 is (C₁-C₆)-alkyl or (C₁-C₆)-haloalkyl;

R^{10} and R^{11} are each independently H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₆)-alkyl, COR¹⁴ or CO₂R¹⁵; or

R^{10} and R^{11} together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl and (C₁-C₆)-haloalkyl;

R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₁-C₆)-alkoxy, (C₁-C₆)-haloalkoxy, CO₂R¹⁶, CN, NO₂, S(O)_qR⁹, COR¹⁶, CONR¹⁶R¹⁷, NR¹⁶R¹⁷ and OH;

R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-haloalkyl, (C₁-C₄)-alkoxy, (C₁-C₄)-haloalkoxy, NO₂, CN, CO₂R¹⁶, S(O)_qR⁹, OH and oxo;

R^{14} and R^{15} are each independently H, (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl or (C₁-C₆)-alkoxy-(C₁-C₄)-alkyl;

R^{16} and R^{17} are each independently H, (C₁-C₆)-alkyl or (C₁-C₆)-haloalkyl;

m, q and r are each independently 0, 1 or 2;

n and p are each independently 0, 1, 2, 3 or 4; and

each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 7 ring atoms and 1, 2 or 3 heteroatoms in the ring selected from the group consisting of N, O and S.

2. The use of a compound as defined in claim 1, in which in which

R^1 is CONR⁶R⁷;

W is C-Cl or C-Br

R^2 is S(O)_mR⁹;

R^3 is $NR^{10}R^{11}$, halogen, OH, (C₁-C₃)-alkoxy, (C₂-C₆)-alkenyloxy or (C₂-C₆)-alkynyloxy;

R^4 is Cl or Br;

R^5 is CF₃ or OCF₃;

5 R^6 is H, (C₁-C₄)-alkyl, (C₁-C₄)-haloalkyl, (C₁-C₃)-alkoxy-(C₁-C₃)-alkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-haloalkenyl, (C₃-C₄)-alkynyl, (C₃-C₄)-haloalkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₃)-alkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-alkylthio, (CH₂)_nR¹² or (CH₂)_pR¹³;

R^7 is H, (C₁-C₄)-alkyl, (C₃-C₄)-alkenyl or (C₃-C₄)-alkynyl; or

10 preferably R^6 and R^7 together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl and (C₁-C₃)-haloalkyl;

15 R^9 is (C₁-C₃)-alkyl or (C₁-C₃)-haloalkyl (more preferably R^9 is CF₃);

R^{10} and R^{11} are each independently H, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-haloalkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₃)-alkyl, COR¹⁴ or CO₂R¹⁵; or

20 R^{10} and R^{11} together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N; the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl and (C₁-C₃)-haloalkyl;

25 R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, CO₂R¹⁶, CN, NO₂, S(O)_qR⁹, COR¹⁶, CONR¹⁶R¹⁷, NR¹⁶R¹⁷ and OH;

30 R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, NO₂, CN, CO₂R¹⁶, S(O)_qR⁹, OH and oxo;

R^{14} and R^{15} are each independently H, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₂-C₃)-alkenyl, (C₂-C₃)-haloalkenyl, (C₂-C₃)-alkynyl or (C₁-C₆)-alkoxy-(C₁-C₄)-alkyl;

R^{16} and R^{17} are each independently H, (C₁-C₃)-alkyl or (C₁-C₃)-haloalkyl; and each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 6 ring atoms and 1, 2 or 3 hetero atoms in the ring selected from the group consisting of N, O and S.

3. The use of a compound as defined in claim 1, in which

R^1 is CONR^6R^7 ;

W is C-Cl;

R^2 is H, or $\text{S(O)}_m\text{R}^9$;

R^3 is $\text{NR}^{10}\text{R}^{11}$, halogen, OH or (C₁-C₃)-alkoxy;

R^4 is Cl;

R^5 is CF_3 ;

R^6 is H, (C₁-C₄)-alkyl, (C₁-C₃)-alkoxy-(C₁-C₂)-alkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₂)-alkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-alkylthio, $(\text{CH}_2)_n\text{R}^{12}$ or $(\text{CH}_2)_p\text{R}^{13}$;

R^7 is H, (C₁-C₃)-alkyl, (C₃-C₄)-alkenyl or (C₃-C₄)-alkynyl;

R^9 is methyl, ethyl or CF_3 ;

R^{10} and R^{11} are each independently H, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-haloalkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₃)-alkyl, COR^{14} or CO_2R^{15} ; or

R^{12} is phenyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, CO_2R^{16} , CN and NO_2 ;

R^{13} is heterocyclyl unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C₁-C₃)-alkyl, (C₁-C₃)-haloalkyl, (C₁-C₃)-alkoxy, (C₁-C₃)-haloalkoxy, NO_2 , CN, CO_2R^{16} , $\text{S(O)}_q\text{R}^9$, OH and oxo;

R^{14} and R^{15} are each independently (C₁-C₃)-alkyl;

R^{16} and R^{17} are each independently H or (C₁-C₃)-alkyl; and

each heterocyclyl in the above-mentioned radicals is independently a heterocyclic radical having 3 to 6 ring atoms and 1, 2 or 3 hetero atoms in the ring selected from the group consisting of N, O and S.

- 5 4. The use of a compound as defined in claim 1, in which
 R^1 is CONR^6R^7 ;
 W is C-Cl;
 R^2 is H, or $\text{S(O)}_m\text{R}^9$;
 R^3 is NHR^{10} ;
10 R^4 is Cl;
 R^5 is CF_3 ;
 R^6 is H, (C₁-C₅)-alkyl, (C₁-C₂)-alkoxy-(C₁-C₂)-alkyl, (C₃-C₄)-alkenyl, (C₃-C₄)-alkynyl, (C₃-C₆)-cycloalkyl, (C₃-C₆)-cycloalkyl-(C₁-C₂)-alkyl, furfuryl or tetrahydrofurfuryl;
15 R^7 is H or (C₁-C₃)-alkyl;
 R^9 is methyl, ethyl or CF_3 ; and
 R^{10} is H, methyl or ethyl.
- 20 5. The use of a compound as defined in claim 1, in which
 R^1 is CO_2R^8 ;
 W is C-Cl;
 R^2 is H, or $\text{S(O)}_m\text{R}^9$;
 R^3 is $\text{NR}^{10}\text{R}^{11}$;
 R^4 is Cl;
25 R^5 is CF_3 ;
 R^8 is H, methyl or ethyl;
 R^9 is methyl, ethyl or CF_3 ;
 R^{10} is H, methyl or ethyl; and
 R^{11} is H.
- 30 6. The use of a compound as defined in claim 1, in which
 R^1 is CONR^6R^7 ;

W is C-Cl;

R^2 is $S(O)_mCF_3$;

R^3 is $NR^{10}R^{11}$, halogen, OH or (C_1-C_2) -alkyl;

R^4 is Cl;

5 R^5 is CF_3 ;

R^6 is H or (C_1-C_3) -alkylthio;

R^7 is H;

R^{10} is (C_1-C_3) -alkyl, COR^{14} or CO_2R^{15} ;

R^{11} , R^{14} and R^{15} are each independently (C_1-C_3) -alkyl.

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7. A composition for plant growth regulation, which comprises one or more compounds of formula (I) as defined in anyone of claims 1 to 6 or an agriculturally acceptable salt thereof, carriers and/or surfactants useful for plant protection formulations.

15

8. The composition as claimed in claim 7, which comprises a further active compound selected from the group consisting of acaricides, fungicides, herbicides, insecticides, nematocides or plant growth regulating substances not identical to compounds defined by formula (I) of claim 1.

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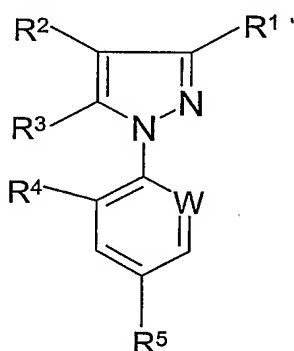
9. The use of a composition as claimed in anyone of claims 7 to 8 for plant growth regulation, in which the plant is a monocotyledoneous or dicotyledoneous crop plant.

- 25 10. The use as claimed in claim 9, wherein the plant is selected from the group consisting of wheat, barley, rye, triticale, rice, maize, sugar beet, cotton, or soybeans.

- 30 11. A method for growth regulation in field crop plants, which comprises applying an effective amount of a compound of formula (I) as defined in claims 1 to 6 to the site where the action is desired said method comprising applying to plants, to seeds from which they grow or to the locus in which they grow, a non-

phytotoxic, effective plant growth regulating amount of one or more compounds of formula (I).

12. A method as claimed in claim 11 that results into a yield increase of at least 10% concerning the plants to which it is applied.
13. A compound as defined by formula (I), or a salt thereof,



(I)

wherein:

- i. R¹ is CO₂R⁸;
 R² is H or S(O)_mR⁹;
 R³, R⁴, R⁵, W and m are as defined in claim 1;
 R⁸ is H; and
 R⁹ is (C₂-C₆)-alkyl or (C₁-C₆)-haloalkyl;

or

- ii. R¹ is CONR⁶R⁷;
 R⁶ is (C₁-C₆)-alkyl, (C₁-C₆)-haloalkyl, (C₁-C₆)-alkoxy-(C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-haloalkenyl, (C₂-C₆)-alkynyl, (C₂-C₆)-haloalkynyl, (C₃-C₇)-cycloalkyl, (C₃-C₇)-cycloalkyl-(C₁-C₆)-alkyl, (C₁-C₆)-alkoxy, (C₁-C₆)-alkylthio, (CH₂)_nR¹², (CH₂)_pR¹³, (C₁-C₆)-alkyl-CN, (C₁-C₆)-alkyl-NR¹⁰R¹¹ or (C₁-C₆)-alkyl-S(O)_rR⁹; or

5

R^6 and R^7 together with the attached N atom form a five- or six-membered saturated ring which optionally contains an additional hetero atom in the ring which is selected from O, S and N, the ring being unsubstituted or substituted by one or more radicals selected from the group consisting of halogen, (C_1-C_6) -alkyl and (C_1-C_6) -haloalkyl; and R^2 , R^3 , R^4 , R^5 , R^7 , R^9 , R^{10} , R^{11} , R^{12} , R^{13} , W, n, p and r are as defined in formula (I);

with the exclusion of the compound wherein:

R^1 is $CON(CH_3)_2$; R^2 is CF_3S ; R^3 is OH; R^4 is Cl; R^5 is CF_3 ; and W is C-Cl.